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Documenting a Cold War Nuclear Reactor Attempting Innovation

In 1939, Nobel Prize-winning physicist Niels Bohr had argued that building an atomic bomb “can never be done unless you turn the United States into one huge factory.” Years later, he told his colleague Edward Teller, “I told you it couldn’t be done without turning the whole country into a factory. You have done just that.”¹

The Hanford N-Reactor complex, located on the last free-flowing stretch of the Columbia River in southeastern Washington, is comprised of over 100 buildings and structures. Courtesy U.S. Department of Energy.

Today, that factory, known as the U.S. Department of Energy (DoE) Nuclear Weapons Complex, spans the country at sites such as Hanford, Los Alamos, Oak Ridge, Savannah River, Rocky Flats, Pantex, and the Nevada Test Site. Hundreds of buildings and structures at these sites have been determined eligible for listing on the National Register of Historic Places, a testimony to their important role in national and local history.

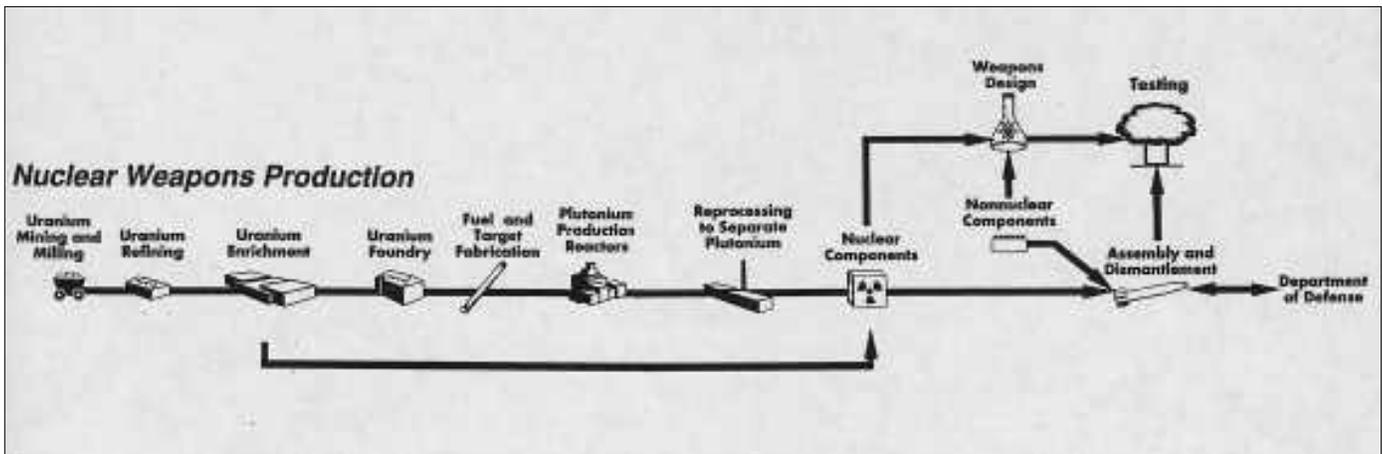
With the Cold War over, DoE is now busy disarming nuclear warheads, cleaning up environmental contamination, and dismantling the complex. Before decommissioning and demolishing the eligible buildings, however, DoE will need to mitigate the effects of these actions by preserving the buildings or otherwise documenting their significance. But how does one document a nuclear weapons facility? It’s not a simple question. One must go beyond the words provided in the National Historic Preservation Act (NHPA) and the Secretary of the Interior’s Standards and Guidelines to understand the intent of the legislation and then develop a documentation approach that is both appropriate and reasonable.

This article describes how DoE is addressing this documentation issue at one of its Cold War-era nuclear reactors, located at the Hanford Site in southeastern Washington State.²

The N-Reactor Pilot Project

The N-Reactor, which operated between 1964 and 1989, was the last of nine plutonium production reactors constructed at Hanford. Since 1989, when the reactor was placed on cold standby, efforts have focused on decontamination and decommissioning. In 1994, cultural resource staff at Hanford proposed a pilot project to evaluate, and if necessary, mitigate the N-Reactor. The advantage to the N-Reactor program would be to accelerate their compliance with historic preservation requirements so they could get on with demolition. The advantage to the cultural resource program was that innovative approaches to evaluating and documenting a subset of significant buildings could be done in advance of the rest of the site historical documentation. The pilot project could then be assessed





The nuclear weapons production process as developed by the U.S. Atomic Energy Commission. The N-Reactor was the nation's most modern plutonium production reactor from 1964 to 1989. From Closing the Circle on the Splitting of the Atom. Photo courtesy U.S. Department of Energy.

and lessons learned incorporated into the sitewide historic preservation program, which was still in its infancy. The N-Reactor Deactivation Program agreed to fund the cultural resource pilot project and work commenced.

The Evaluation

A team knowledgeable about Hanford history and technology was formed to evaluate the historical significance of the facility. They found that N-Reactor was significant to the history of Hanford, the region, and the nation for reasons explained below.³

Hanford is an important historic site. Hanford's mission in the early 1940s was to construct the world's first full-scale reactors and separations facilities, irradiate uranium, and separate the resulting plutonium.⁴ The plutonium was then shipped to Los Alamos where it was used in producing nuclear weapons. The first nuclear bomb ever exploded was a test, code named Trinity, conducted near Alamogordo, New Mexico, on July 16, 1945; Hanford provided the plutonium for this test. On August 6, 1945, the United States dropped an atomic bomb, known as "Little Boy" on Hiroshima, Japan. Three days later, another atomic bomb, "Fat Man," was dropped on Nagasaki, Japan. Five days later, the Japanese surrendered and World War II was over. Little Boy contained uranium produced at the Oak Ridge facility in Tennessee, and Fat Man contained plutonium produced at Hanford.

The nation's Nuclear Weapons Complex underwent a series of expansions during the 1950s as Cold War concerns heightened. The N-Reactor at Hanford, which incorporated new technology in several areas, represented the last of these expansions. Whereas the previous eight reactors at Hanford incorporated the same basic graphite block, water-cooled technology, the N-Reactor incorporated several design modifications. For example, water used to cool the reactor core was recirculated in the reactor rather than disposed of in the Columbia River as was the case with the

other eight reactors at Hanford. This modification addressed an escalating concern in the region, namely that the Hanford reactors were dumping radionuclides into the river.

The N-Reactor was also designed in conjunction with a steam generating plant, added in 1963, that produced electricity for the region. N-Reactor became the first dual-purpose reactor in the United States. For many years, it was the largest electricity-producing nuclear plant anywhere. Selling the electricity enabled the government to drive down the cost of producing plutonium.

As the most advanced production reactor to be built at Hanford, and the only operating production reactor at Hanford from 1971 to 1989, the N-Reactor was considered one of the major contributing facilities to the overall site history. The DoE, therefore, determined that the N-Reactor facility was eligible for listing on the National Register of Historic Places. The Washington State Historic Preservation Office (SHPO) concurred with this determination.

Documenting N-Reactor

In 1995, the DoE and the Washington SHPO began negotiations concerning the makeup of the proposed Hanford Site Manhattan Project and Cold War Era Historic District and the ways such a district could be mitigated. While negotiations were underway, the N-Reactor historical project continued on its separate path, advancing the pilot project philosophy.

A research design was developed that drew heavily on recommendations from the Advisory Council on Historic Preservation's report, *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities*.⁵ The first step was to identify individuals who would use the documentation and determine what their information needs might be. This analysis concluded the following:

- The Public: Efforts should be made to collect and preserve materials that would be useful from a public perspective.

- **Historians, Social Scientists, and Historic Preservationists:** A basic documentation about the history and life at the reactor should be prepared to satisfy their interest in various aspects of N-Reactor's genesis, performance, and worker-related issues.
- **Nuclear Scientists and Engineers:** Because information on the technological aspects of N-Reactor was already on record in countless professional documents and publications, these individuals were viewed as having little interest in the abbreviated technical information which might be included in this report.

Based upon these assumptions, the following activities were completed:

- Reports, photographs, and objects with documentation and public interpretive value were collected and catalogued.
- An interpretive event was held at the local science center that focused on the history, technology, and contributions of the N-Reactor; the feature presentation was a movie of President John F. Kennedy's October 1963 speech at the groundbreaking for the N-Reactor steam generating plant.
- An oral history program was started with former N-Reactor workers to document the history from their perspective.
- A three-volume documentation package was prepared.⁶ Volume 1 is a public-oriented, well-illustrated overview of N-Reactor that documents the history of the facility and its significance to Hanford, its workers, the region, and the nation. Volume 2 includes descriptions for all buildings and structures. Volume 3 is a "Guide to N-Reactor Resources," prepared to assist future researchers interested in finding additional information about the N-Reactor. Historic Property Inventory Forms for all permanent buildings are on file at the Hanford Cultural Resources Laboratory.

All documentation derived from the N-Reactor Pilot Project will now be utilized in meeting the documentation requirements of the Historic Buildings Programmatic Agreement, which was agreed to by the DoE, the Washington SHPO, and the Advisory Council on Historic Preservation in August 1996. Sitewide mitigation efforts began in Fall 1996.

Summary

Fifty years ago, Hanford was chosen as the place where nuclear theory was transformed into

practical applications in reactors and chemical separations plants. Today, Hanford is again transforming theory to practice, this time in the area of historic preservation at the site's nuclear facilities. For the N-Reactor, innovative approaches were attempted to adapt the Advisory Council's 1991 recommendations for sites such as Hanford.

DoE and the historic preservation community now have a completed nuclear facility documentation package to evaluate. Where the documentation succeeds, the methods can be applied elsewhere; where the efforts failed, we can go back to the blackboard. Such is the nature of innovation.

Notes

- ¹ U.S. Department of Energy. 1995. *Closing the Circle on the Splitting of the Atom: The Environmental Legacy of Nuclear Weapons Production in the United States and What the Department of Energy is Doing About It*. Office of Environmental Management. Washington, D.C.
- ² Stapp, Darby C., Joy K. Woodruff, and Thomas E. Marceau. 1995. "Reclaiming Hanford," *Federal Archeology* 8(2)14-22.
- ³ Stapp, Darby C. and Thomas E. Marceau. 1995. *The Hanford Site N-Reactor Buildings Task: Identification and Evaluation of Historic Properties. BHI-00627*. Bechtel Hanford Company. Richland, Washington.
- ⁴ Gerber, Michele S. *On the Home Front: The Cold War Legacy of the Hanford Nuclear Site*. University of Nebraska Press. Lincoln.
- ⁵ Advisory Council on Historic Preservation. 1991. *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities*. Advisory Council on Historic Preservation. Washington D.C.
- ⁶ U.S. Department of Energy. *N Reactor Comprehensive Treatment Report, Hanford Washington*. 1997. DoE/RL-96-91. Richland, Washington.

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